DOCUMENT RESUME

ED 138 293 IR 004 723

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TITLE Computer Outreach.
PUB DATE Sep 76
NOTE 18p.; For related documents, see IR 004 713-714

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Computer Oriented Programs; *Computers; *Educational Games; Higher Education; *Humanization; Information Systems; *Older Adults; *Outreach Programs; Schools of Education; Simulation; *Use Studies

ABSTRACT

Computer outreach refers to the application of local computer capability to the development of new or improved computer uses. This study describes three outreach areas. "Computer uses for elders," the first area, focuses on elders as a new group of computer users or clients. The second area, "computer use and abuse," aims at helping to insure the humanized use of computer-based information systems. "Cooperation games," the final area, concerns a deeper social relevance of computers. The study ends with a discussion of the organization of outreach activities in the College of Education at the University of Illinois at Urbana, and suggests that similar activities be undertaken in industry, business, and government. (DAG)

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September 1976

Computer Outreach

Bruce Hicks

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A modified version of this paper will be published in the Fall 1976 issue of "Computers and Society"

IR004723

Computer Outreach

1. Introduction

Equality of opportunity implies universal access to education and to modern tools. The computer is a modern tool that can provide important components of service to many people in many areas, education being only one. But people's access to computers lags far behind the technological capability of providing this access, and there is inadequate appreciation of and demand for computer outreach that would be universally advantageous and feasible.

As educators we want to encourage new alternatives in education (considered rather broadly) that are suggested by the computers' capabilities and society's needs, recognizing always that the welfare of the people serving or being served with the help of computers is of central importance (1). Computer outreach would provide these new alternatives in education.

We shall discuss three types of computer outreach in this paper: outreach which supplies computer access for new clients; that which provides improved quality of access; and that which initiates computer applications of deep social relevance.

Although the three types of outreach clearly touch and affect society in different ways, they are similar in other respects. Thus, the services provided in each type of computer outreach may be direct (first order or hands-on) or indirect (second-order or through an intermediary advocate or agent), and each type of computer outreach should be accompanied by continuing education toward computer literacy and by the humanizing of computer-based information systems.

When we recognize all of these aspects of computer outreach then we can aim at universal outreach or "computer access for everyone." (For a discussion of one approach to this access for everyone see Reference 2.)

In principle all organizations that provide or control computer access should help to provide greater computer outreach, for each can help make some part of this outreach possible and each stands to gain better insights into its uses of computers and their interaction with the community and with other parts of society.

The purpose of this paper is to encourage, through discussion of our explorations of university-based computer outreach, parallel computer outreach activities in industry, business and government as well as in the schools and colleges.* Our computer outreach is at the interface between the university and individuals and groups outside universities. We apply local computer power to the development of new or improved computer uses and we thereby enrich our understanding of what computers can and cannot do well, a never-ending quest in computer outreach, as it is also in the educational applications of computers.

Each of the three computer outreach areas we discuss emphasizes one of the three aspects of computer outreach listed earlier but does not ignore the other aspects. There were three areas of study:

Computer uses for elders**	which focus on the <u>elders</u>, a new group of computer users or clients
Computer use and abuse	which aims at helping to assure the humanized use of computer-based information systems
Cooperation games	which take a step toward deeper social relevance of computers

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* We recognize, but cannot discuss here, that there is a "threat of technology to mind" and that, although modern technological society "embodies the highest levels of the scientific mentality, its very success militates against the sharing of that rationality by the individual participants in the systems" (3). We would argue that much greater computer outreach would help to share and put in perspective that "rationality".

** Elders is the term for senior citizens used by Maggie Kuhn, National Convenor of the Gray Panthers.

We shall also discuss the organization of our activities in a college of education as a basis of comparison with the implementation of computer outreach activities by other types of organizations.

We wish to acknowledge the contributions made by all of the many people who have worked on our outreach activities but will have space only to mention a few by name here and elsewhere in the paper. Wm. P. Goddard (4,5,6) pioneered in British Columbia in developing "computers for the whole school", thereby building more widespread computer literacy and a feeling of community across each school. Our activities have essentially been extensions of his work and philosophy from the schools into the wider community and toward wider social concerns.

The participation of elders in their part of the activities was both essential and very fruitful. All of the activities were staffed by students, and what has been accomplished is primarily due to their initiative, insight and ability.

2. Computer Outreach in Three Areas

2.1 Computer Uses for Elders* (New Clients)

One step toward computer access for everyone is the development of computer uses for elders. The computer outreach here is to a large group that does not now have either first or second order access to computers. In developing computer uses for elders there is opportunity for simultaneous development also of computer literacy and of intergenerational cooperation and understanding as two of the components of humanizing the information systems.

One purpose of our activities in this area was to find and generate prototypes of computer uses for elders. We had in mind three sub-areas: education, consumer information and recreation. We also wanted to encourage participation and responsiveness of students and elders, and their agents, in the development and evaluation of computer uses for elders.

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* For a fuller account see Reference 7.

In trying to achieve these purposes we were supported by the knowledge that many groups--minorities and children as well as elders--do respond and contribute when they see that unfamiliar innovations and new tools can directly serve their interests and needs. More specifically, we were encouraged by the results of a survey in Vancouver, British Columbia (8) that demonstrated the interest of elders there in pursuing a variety of uses of computers.

The teams developing our ideas and materials for computer uses for elders included a total of nine undergraduate and graduate students and a few high school students, representing many different disciplines and pre-professional curricula, together with some 20 elders. The characteristics of the latter were quite varied--black, white, poor, well-to-do, and well- or poorly educated. Few had typing skills and only one had computer programming experience.

These teams explored available, interactive, computer programs on PLATO and the DEC 10 time-sharing system to find which programs were adaptable to elders' needs and interests. They also invented and developed two new programs suggested by the elders: FOOD FOR THOUGHT (which provided quotations and comments appropriate to an elder's mood) and MENU (which supplied menus for balanced meals according to an elder's specification of type of meal desired).

Both in finding existing programs and developing new ones we reconfirmed the principle familiar in educational applications of computers, that small programs responsive to the individual or small group's interests and capabilities were more useful than larger "canned" programs that had optimistically been designed to be all things to all users.

In their continuing cooperative study of computer uses for elders during the three semesters the teams of elders and students generated many guidelines for future work in this field. We will quote five of the guidelines:

a. In developing computer uses responsive to the needs of elders, develop simultaneously the network of interpersonal and intergenerational relations among elders, students, faculty, agency staff and community staff and the training of these people that will make possible the creation of valuable computer uses for elders.

b. Plan computer programs for specific groups of elders but do not eliminate other programs from consideration. Elders, like people of any age, do exhibit individual differences in needs and styles of communication and learning.

c. Reduce the difficulties inherent in poor typing skills of many elders by letting elders dictate to a more skilled typist (another elder, if possible) or through technological improvements (alphabetized keyboard or touch-sensitive display, for example).

d. Carefully balance on-line and off-line materials so that the computers are only used for what they can do better than other media and other educational information retrieval and recreational tools.

e. Do responsive evaluation that requires the participation and often the leadership of elders and students.

We may also conclude from these informal but intensive studies that elders do have a definite interest in their uses of computers and that they can, working with students and some staff, contribute directly toward developing these uses. There was evidence of the receptiveness and perceptiveness of these lay-elders to important aspects of computer literacy. There was clearly a general need for the portable, self-contained, easy-to-use small computers discussed in Section 3 and a special need for this kind of computer power (for elders or their advocates) to aid them in overcoming the deficiencies of large and centralized data bases.

Industry and business may find that there are valuable computer-based components of their retraining of elders for new jobs and of pre-retirement planning for retirement. Paid or volunteer workers cooperating with elders might take the place of the student workers in our activities.

Everyone must come to terms with his own aging and with improving the lot of the elders in society. Computer uses for elders can be part of this search for cooperation and understanding, particularly by those with some computer background and with access to computers and by those who see that the conventional use of large computer systems for the purposes of large organizations provide computer access neither for elders nor for many other groups.

2.2 Computer Use and Abuse (Quality of Access)

Computer access for everyone should go hand in hand with computer literacy, one supporting the other. Neither is here today, but computer-based abuse of privacy and other rights is here and is growing. Computer literacy for laymen (and for the few computer professionals who are illiterate with regard to privacy invasions) should include understanding of and advocacy against computer-based invasion of privacy, as well as understanding of beneficial computer uses. Our computer outreach here seeks better, more widespread understanding of privacy and of what Theodor Sterling calls "humanizing information system."(9)

Our purpose in this area of our activities has been to enlist university students and staff in collecting and preparing on- and off-line materials on computer use and abuse. Among the papers that have been useful to us are many that have been published in Computers and Society and also the excellent paper by Sterling.

One part of our activities was a project to develop "A Computer-Systems Sourcebook for Governmental Officials in Central Illinois Communities." The first part of the book was to provide the local government officials with legal, legislative

and technical background on the use and control of computers by city council, county board of supervisors, police, school systems, etc. The second part of the book was to inform citizens and community organizers how computers affect their lives and what, with the help of local computer ombudsmen, they could do to improve the quality of computer service. Eight students* collaborated in preparing a grant proposal to the National Science Foundation and preliminary work on the book. Although this application for support was unsuccessful, the students' work (in planning the project, interviewing local government officials and finding advisors for them, getting their supporting letters, collecting and organizing information for the sourcebook and, of special importance, discussing the balance between advocacy of certain positions about computer-based privacy invasion and purely informational content in the book) gave the students varied and valuable experience and provided technical assistance to local government officials. (Some of the irrational aspects of grantsmanship the students encountered must be regarded as informative but otherwise unrewarding parts of their experience.)

A second part of our activities was the conception and programming (by Robert Zielinski) of a computer simulation called SEC (for security). SEC describes and simulates data bases and their creation and misuse. The topics in SEC are:

- Computer data bases and records
- Conventional and not so conventional generation of data bases
- Simulations: credit reports, police information network, "be an executive" (security and passwords), protection failure
- Predictions

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* Glenn Kowack took primary responsibility for organizing these student-originated studies. Special thanks are due to Paul Schroeder (a special Assistant in the College of Liberal Arts and Science) who conceived the project and found interested students and advisors.

We felt that the sourcebook and the computer simulation are necessary and complementary parts of any effort to inform those government officials who are laymen in computer matters about the realities of computer-based invasions of privacy. The hands-on experience with SEC is dramatic and realistic and did serve, as we had hoped it would, as an excellent starting point for small group discussions of the advantages and dangers of data bases and their management.

Careful interviews with people from the community who used SEC led to a number of suggestions about extensions or other modifications of the program and also to a good first sampling of reactions to the program and its purposes. SEC increased the concern about (and understanding of) computer-based invasions of privacy for those already concerned about this danger. The simulation by itself did not change the views on computer privacy of those people (whether or not they had computer background) who had already decided to ignore the dangers.

We would hope that in the future our group and other groups would be able to proceed with the development of sourcebooks similar to what we proposed (10). We would like to see extensions of SEC and wide use of such illustrative simulations. The program is highly portable since it is written in BASIC, the language that is used in the majority of the schools that support instructional applications of computers. We feel that this or similar programs will be generally useful in colleges, schools, business and industry, if part of the content of SEC is made directly relevant to specific organizations and if use of the program is always followed by group discussion with knowledgeable advisors about the privacy problems simulated and other related questions about data bases, computer systems and the rights of individuals.

We are particularly interested in the use and development of SEC-like programs by high school students, as part, say, of their social studies classes. We would hope that SEC can begin to stimulate the development of many similar programs to

be used by students, faculty, parents and administrators generally in the schools, again always accompanied by group discussion. There is strong evidence (6) that students gain an increased sense of community when they are given and accept responsibility for development of simulations and other programs that are useful for the whole school. The computerniks among the students can help to show the whole school about privacy and security, an important segment of computer literacy.

Security and privacy are clearly of concern to many in business and industry, and the more responsible and well-informed will agree that citizens' rights of privacy are more fundamentally important than the cost of privacy protection, but that the different rights or needs of citizens are often contradictory. (See Reference 9). We would suppose that sourcebooks and privacy-security simulations would be needed for middle management in business and industry and would hope that materials and simulations that are developed anywhere can be shared among the interested organizations.

2.3 Cooperation Games (Social Relevance)

Cooperation, in contrast to competition, clearly has a place in peace research and conflict resolution and has been studied and used more in classroom teaching than is generally recognized (11). Competition in the classroom and in business (and its ultimate and perverted extension into violence and war) clearly predominate in much of the world's activity and in public consciousness. A simple but non-trivial example is the glut of war games on most interactive computer systems.* The question of whether war games release in non-harmful ways "natural" impulses of hostility and fear or instead train one to be dispassionate and dehumanized in

* How much different is the minute-by-minute activity of a bomber pilot who uses the dancing spots on a radar display to napalm anonymous, unseen, dehumanized combatants and non-combatants, and the action of one of the thousands of computer game-players who follows the dancing spot on his display as he destroys anonymous, dehumanized "enemies" on warships or spaceships?

warfare cannot be settled here. It is doubtful though whether cooperation, in some ways a more complex behavior than competition, can be learned or understood solely through experience in competition. But we believe that computer outreach should provide cooperation as an alternative to competition, and peace-seeking as an alternative to war-making, and in this way make computer use more relevant to societal values.

Our purposes in this computer outreach activity were to produce an attractive computer-based cooperation game as a recreational game for the many avid computer game players* (starting to counteract that plethora of war games) and to provide a vehicle for research and teaching about cooperation games. Computer outreach here was clearly a step toward deeper social relevance.

Some simulations that our students have developed included cooperative aspects more or less by accident, for example a simulation of parliamentary procedure according to Roberts Rules of Order and a simulation of bargaining between a teachers' union and a school board. What we shall discuss here are two variations of one game that from the first we intended to be a cooperation game. Teams of students invented, programmed for PLATO, and refined a game, called SOS, over a period of three semesters.** During a recent period of five months some 10,000 games of SOS were played by one to three players at PLATO terminals throughout the United States. In the game the players find themselves shipwrecked on a remote island. They have the option in each period of the game of digging for gold or building boats of various sizes to save themselves from the approaching hurricane. They can trade the tools available among themselves and cooperate or not in other ways. After a certain number of periods the storm strikes and each player is told whether he survives the storm and with how much of his gold.

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* The passion for computer-based games is a quite visible phenomena but one that, to my knowledge, is not yet well enough understood so that it can be surely exploited for educational purposes.

** Kent Waldrop has been the principal designer and programmer of SOS.

Joe Taylor programmed in BASIC a second version of SOS, which he calls "Lost and Forgotten Island" (LAFI), for the DEC 10 time-sharing computer. This version differs from the PLATO version in the requirement that all players of a game are located at the same terminal. This one-terminal, BASIC version can, unlike the PLATO (TUTOR language) many-terminal version, be implemented in most high schools with computers used for instruction. It should be noted that the restriction to one terminal changes the type of group interaction that is facilitated. With one terminal there can be and usually is direct interaction among the players; with many terminals only the impersonal and limited written communication through PLATO's messaging capability is possible.

Both SOS and LAFI are rich games. They incorporate a mix of several values and many sources of information (accumulating gold and saving one's life; trading tools, joint planning of moves and other forms of cooperation; continued presentation of status of the gold digging and boat building; and up-dates on the storm's expected intensity and time of arrival). It would be easy to collect data, particularly on PLATO, on the mode of play of the players as their moves respond to the effects of previous moves and the progress of the storm. It would be possible also to repeat part of the programmed pseudo-random series of "events" in the game so that different players could be presented with rather similar sequences of situations.

To make possible useful analysis of such data what is needed now is a theoretical framework defining classes of cooperation games and categories of cooperative behavior; and also, just as for any simulation of people's behavior, a requirement that the players look behind the scenes to see the nature and limitations of the model that controls the behavior of the simulated "world" in which the game takes place. The distance between the real world and a simulated

world is always large and largely unexplored. Part of this framework might be found in the studies of simulations and games representing management, decision-making and political processes, for these include intra-company or intra-country cooperative behavior and occasionally cooperation among companies or nations.*

We feel that, in principle, all citizens, and in particular, all high school and college students should have some experience with cooperation games and subsequent analysis of the valuing implied by the games. We also feel that conscious, intentional consideration and emphasis of the cooperation aspects of games and simulations would have advantages for the training and socializing of many employees in business and industry as well of students and others in the schools.

2.4 Organization of Activities in the College of Education

The computer outreach activities have been conducted primarily as projects in two courses in the Department of Secondary Education, "Computer-Assisted Instruction" and "Computers for the Whole School".** Specific phases of the activities are also becoming part of the experience of graduate students in their masters and doctors programs as they are being trained for leadership roles in the educational application of computers. In addition to many students from the two courses, further "staff" has been added for each of the three activities: elders and some people from social service agencies and from the Department of Social Work for the project on computer uses for elders; a systems programmer on campus, an attorney in the National Clearing House for Criminal Justice and members of the Urbana City Council for the project on computer use and abuse; and other individuals and groups developing or evaluating cooperation games and simulations, especially Weiss and his co-workers on the Near East simulation.

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* A PLATO simulation of cooperation and conflict in the Near East has been developed, chiefly by Jerry Weiss, a student working independently of class projects.

** Thus we have not waited to get outside funding.

The computer facilities available to us have been the DEC 10 time-sharing system (DECwriter and Infoton display terminals) and the PLATO CAI system (plasma display panels). We are in the process of acquiring a micro-computer-based system like that described in the next section.

We may suggest some analogous means of implementing such activities in business and industry. Any in-service classes employing educational applications of computers could adopt the project approach used in our classes and through the projects contribute to the development of one or more phases of computer outreach and access for everyone. These projects might be supported directly by a unit or division in the organization conducting the in-service training. For example, the organization could supply computer facilities to the students or volunteers, and in some cases paid workers, who came from inside or outside the organization and who are developing and evaluating aspects of computer outreach.

Important ingredients in successful computer outreach are early and direct participation of the lay "client", and using computer facilities that have not been but can be made available for these activities. Just as in the university or school environment, computer outreach aimed toward computer access for everyone can become, for business and industry, a firm basis for building cooperation and mutual understanding among groups in the community and those within the organization, and for developing common goals and aspirations.

3. Conclusions

We have discussed three areas of computer outreach: computer uses for elders, computer use and abuse, and cooperation games. Each reaches out in a different way: to new clients, to improved quality of service, and to increased social relevance. The extension of our work beyond university-based activities would

also display differences. Thus we would expect that companies could offer new components of computer uses for elders, and not only in re-training and pre-retirement planning suggested earlier. Businesses have valid concerns about internal and external aspects of computer-based invasions of privacy, and this breadth of concern and accompanying development of competence can be shared with other organizations and individuals who face these problems. Likewise the fact that companies work in a milieu combining cooperation and competition could lead to better understanding of the design and applications of cooperation games.

Our work has been based on projects carried out by the students, with some guidance and participation by faculty and others. It may be difficult but certainly not impossible to find, outside the educational institutions, those who will work on computer outreach with imagination, ability and zest for inquiry that has characterized the students.* And we note that the client and his participation are equally important in the computer outreach development whether it is based in educational or on other institutions.

An essential ingredient in improved computer outreach, and in the ultimate objective of computer access for everyone, is local computer power that will give local control, hands-on-experience, easier assurance of privacy protection and low cost. Systems with these capabilities that are portable and can talk to larger computer systems when necessary are already available in the maxi-calculators** made by a number of companies. It is now possible to assemble a small computer system based on a micro-computer that is more powerful and less expensive than a maxi-calculator though at present not quite as convenient to use.

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* The work described in Reference 2 shows that this is possible though not without its difficulties.

** A typical maxi-calculator includes hard-wired BASIC, cassette tape or floppy disk secondary storage, card and keyboard input, printer, and data communication capabilities.

The versatility and power of computers is not new, but the call for general availability of this power for the good, directly or indirectly, of individuals in society has seldom been heard and until recently could not easily be satisfied. Technology is no longer the limitation; but computer access for everyone requires exploration, such as we have started, more general awareness of the potential of the outreach, and training of professional and lay people to help build this computer outreach.

These are educational tasks but ones that can be shared between educational and other organizations. Education does not start nor stop in the schools. It is not only universities that have educational programs, computer facilities and valuable specialists to help implement wider computer outreach. We emphasize again, therefore, that the responsibility for moving toward computer access for everyone is a distributed responsibility to be shared by all individuals and organizations that can contribute to and participate in this enterprise.

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